

**CITY OF DURHAM
NPDES STORMWATER PERMIT
ANNUAL REPORT
JULY 1, 2006 - JUNE 30, 2007**

General

- The City of Durham is authorized to discharge stormwater runoff from the City's municipal separate storm sewer system (MS4) by NPDES permit NCS000249. The City of Durham's Stormwater Services Division is the lead agency in carrying out the City's NPDES municipal permit and the associated Stormwater Management Program, although other Programs, Departments and Divisions play integral roles.
- The City of Durham's Stormwater Management Program is supported by a stormwater utility fund. The utility fee is based on impervious surface. Authorized positions in FY07 funded by the stormwater utility include 54.6 positions in the Public Works Department, and 28 positions in Solid Waste, for a total of 82.6 full time equivalent (FTE) positions. Authorized positions increased by 14% during FY07.
- The Stormwater Services Division provides services related to the management and improvement of surface waters. Activities of this division include managing the construction, repair, cleaning and maintenance of storm water infrastructure, the location and mapping of the infrastructure and coordination of all stream restoration activities. Construction projects include assistance to private property owners with drainage repairs on private property, drainage systems on City owned property, and maintaining the drainage system within street rights of way. The program also is responsible for floodplain management activities that include management of the FEMA FIRM Map Repository, flood mitigation, and technical support of the local Floodplain Administrator. Mandated stormwater quality management activities include development review; industrial/municipal inspections; chemical, physical and biological monitoring; public education; public involvement; and illicit discharge detection and elimination. The Development Review group provides comprehensive reviews and permitting of plans for stormwater infrastructure improvements and as-built certification verification. The stormwater billing unit is responsible for maintaining the geographic information system impervious area database for land parcels, together with a stormwater billing accounts database for all developed land that is billed. The billing unit is also responsible for handling all customer service inquiries and appeals.
- In November 2006, the City adopted a revised illicit discharge ordinance. The revised ordinance provides the ability to implement escalated enforcement when necessary to achieve compliance.
- During the year, the City received NPDES industrial stormwater permits for its Solid Waste Truck Wash facility, and for its Public Works Operations Center. Also during the year, the City's DATA bus maintenance moved to a new location, and the contract operator of the facility applied for and received permit coverage.
- The City participated on a technical advisory committee to develop a nutrient management plan to protect Falls Lake, which is likely to be added to the 303d list of impaired waters for chlorophyll a. The City has continued to evaluate rules and

planning-level costs for complying with draft rules pursuant to a Jordan Lake Nutrient Management Strategy. With both Jordan Lake and Falls Lake impaired by excess levels of nitrogen, a number of staff members participated in a web-cast sponsored by Tetra Tech on “It’s Not Just Phosphorus that Controls Trophic State in Fresh Waters” conducted by Randall Dodd.

- During the year the City began participating in development of local watershed plans for Lick Creek, and for Northeast Creek. This includes conducting stream assessments, identifying pollution sources, screening alternative control strategies, and identifying potential retrofit locations within the watershed. The City also selected a consultant to update the Ellerbe Creek Local Watershed Plan and to develop more detailed implementation plans for the watershed.
- Staff is providing support for several NC Ecosystem Enhancement Program stream restoration projects planned, in-design, or under construction.
- During the fiscal year, the City filled several newly authorized positions. To enhance the ability to inspect industrial sites that discharge to the MS4, the City added an Industrial Inspector position. To enhance the ability to inspect and manage stormwater management systems (detention basins, treatment BMPs) on private property, the City added an engineering position, an inspector position and an administrative assistant. To enhance the ability to inspect construction of stormwater conveyance systems in public streets, the City added two additional engineering inspector positions.
- During the third quarter of the fiscal year, staff revised a previously unfunded budget initiative to hire two staff members to conduct dry weather screening at outfalls in the priority areas, and to conduct follow-up illicit discharge investigations and enforcement actions resulting from the dry weather screening. An additional initiative was prepared to add a staff member to assist in addressing management issues. These initiatives were approved in the FY08 budget.

Public education and outreach

The City has a very active public education and outreach program. The City also conducts a significant portion of its mass media effort through funding and active participation in the Clean Water Education Partnership (CWEP). CWEP is a consortium of local governments and state agencies that develop and fund an annual mass media public education campaign. This fiscal year, Durham actively participated in the task group that developed an original CWEP television spot on buffer maintenance. The spring 2007 TV campaign alternated an “action” spot - CWEP’s new “Buffer Improvement” spot - with an “awareness” spot, NC DENR’s new “Johnny Fishpatrick” PSA spot. The campaign targeted the demographic most likely to change the oil in their own vehicles. CWEP had additional funding this year in the form of a 319 grant and ran a heavy television campaign in the spring of 2007, and also conducted a parallel radio campaign that also alternated “awareness” spots and “action” spots.

The media outlets were selected based on market research into our target audiences. The City distributes a brochure called “Clean Water Guide for Homeowners” developed by CWEP that explains how homeowners can adopt water-friendly practices.

The City conducted local outreach separate from the efforts of CWEP. This includes placing posters on buses to encourage recycling of used motor oil; placing articles in City news outlets, utility bill inserts, cable community access channel, "Info Corner" ads in local papers; working with local TV and radio stations to advertise events and run PSAs; and issuing press releases to increase public awareness of stormwater issues and opportunities for involvement.

A Speakers Bureau makes presentations to school groups, clubs, civic groups, churches, colleges, homeowners associations, scout groups, etc. At local festivals, trade shows, health fairs, etc. the City uses a commercial exhibitor table-top display to educate the public about water pollution, stormwater runoff, and the City's Stormwater Services Division. The City also makes presentations at schools and offers water quality training for educators, including Project Wet workshops and Its Our Water workshops.

The City employs a number of different methods of teaching about the impacts people can have on water quality. A core teaching tool is the *EnviroScape* three-dimensional watershed model. This interactive model demonstrates non-point sources of pollution from a variety of land uses. Best management practices can also be demonstrated. Other materials include videos, games, activity books, posters, brochures, and handouts. At special events, the City provides giveaways that include a clean water message or that promote the Water Pollution Hotline. Current giveaways include duck clips, rubber ducks, pens, pencils, magnets, and Mutt Mitts. The City is increasingly incorporating social marketing methods such as pledges into its outreach events.

The City maintains a website, www.durhamnc.gov/stormwater, from which additional educational materials may be obtained. The City also financially supports, contributes educational materials to, and promotes the CWEP website, www.nccwep.org.

Some specifics on what was accomplished during the fiscal year include:

- Eight articles in newsletters or City utility bill inserts. Two utility bills included a special stormwater "Waterways" insert. PDF versions are available on [Durham's Stormwater Education website](http://www.durhamnc.gov/stormwater).
- Fifteen articles or advertisements in local newspapers; each of these articles or advertisements addressed some aspect of the City's stormwater program: stream clean-ups, stream restorations, local water quality conditions and regulations, and special events.
- Made 32 presentations to school groups, reaching 963 students.
- Made 13 presentations to business and community groups, reaching 316 participants.
- Displayed at or sponsored 10 special events, reaching 1977 people.
- Advertised proper used oil disposal on local City buses (English & Spanish).
- Held a 10-hour Project WET educator workshop.
- Radio Public Service Announcements:
 - (1) WNCU and WDNC Radio – April, 2007 – 30 daily environmental tips

- (2) Clean Water Education Partnership – 249 spots in Raleigh-Durham market, targeted to people who maintain their own cars; primary audience was identified as individuals likely to change their own oil and/or wash their own car, with the primary target demographic being males aged 18-34; the campaign used two primary messages that were developed into six different spots to provide an awareness and an action spot for each of three different sub-targets: Urban, Hispanic, General/other with four messages in English and two in Spanish, depending upon the demographic of the broadcast radio station. Campaign performance is reported in **Table 1**, found in the appendix. The spots with descriptions can be found on the CWEP website at <http://www.nccwep.org/outreach/radio.php>
- **Television Public Service Announcements:**
 - (1) WTVD – April, 2007 – 10 spots advertising Durham’s Earth Day events, including the volunteer stream clean-ups; 1 interview highlighting Durham Earth Day Festival and stream clean-ups.
 - (2) Clean Water Education Partnership: 1,118 spots resulting in 22,985,500 impressions in the Raleigh-Durham-Chapel Hill Triangle market. Spots alternated between awareness (storm drains flow directly to waterways) and action (maintain your streamside buffer) messages. Two full campaigns were run approximately one month apart (one in late February and one in early April) with some spots run in the interim during the ACC Basketball Tournament. The target demographic was men ages 35–54, homeowners, who spend less than \$500 per year on lawn care. Research shows that this is the demographic most likely to do their own yard care (rather than hiring a service); CWEP’s riparian buffer spot was designed with this group in mind. Campaign performance is reported in **Table 2**, found in the appendix.

Public Education and Outreach Summary

- Participate with Clean Water Education Partnership (CWEP) which spent \$103,409.85 on two television PSAs, and \$24,624 on two radio PSAs.
- Promote and maintain a website <http://www.durhamnc.gov/stormwater>
- Contribute content and photos to Clean Water Education Partnership website www.NCcleanwater.org
- Distribute educational information
- Make presentations at schools, HOA, church groups, businesses, civic groups
- Participate in community events
- Hispanic Outreach Campaign (bilingual handouts, bilingual IDDE outreach)
- Respond to customer requests
- Media Campaign - TV, radio, newspaper, newsletters
- Conduct workshops/seminars for teachers and the development community
- Signs on city Buses (English & Spanish)

Public involvement and participation

The City offers several mechanisms for public involvement:

Adopt-a-Stream

Solicit volunteer groups to adopt a stream through NC Stream Watch. Groups agree to a two-year commitment to monitor stream and pick up litter at least twice per year. Higher-level commitments involve monitoring stormwater outfalls and measuring chemical and biological water quality parameters.

Business Recognition Program

Offer industry-specific clean water best practices and recognize businesses for implementing strong pollution-prevention measures. Details of the program are found on the web at: www.durhamenvirostars.org.

Environmental Affairs Board

This City-County panel of eleven individuals with environmental and technical backgrounds is a citizen advisory panel. The EAB meets monthly and receives input from the public, makes recommendations on environmental policy, educates the public and local officials on environmental issues, performs special studies and projects on environmental questions, facilitates citizen participation on environmental matters, studies changes in environmental science and law, promotes intergovernmental and public/private cooperation, etc.

Keep Durham Beautiful

Community Litter Cleanups—KDB assists groups who want to organize and carry out local litter cleanups. Ownership—Groups or individuals sign a contract to take responsibility for the appearance of a street, corner, park or other piece of public land. Education—KDB works to educate and inspire school children and adults alike in all that can be done to improve the appearance and safety of our community.

Storm Drain Identification Program

Solicit groups to volunteer to place anti-pollution stickers on older storm drains (new storm drains have messages embedded in the cast iron). Stickers are designed to inform citizens that stormwater runoff flows untreated to waterways.

Stormwater Hotline

Actively promote hotline for citizens to report water pollution, 560-SWIM (or 560-7946) in utility bill inserts and newspaper and on give-away promotional items distributed at public events described in the section on Public Education.

Stream Cleanups

Solicit volunteers to pick up litter along stream banks and in streams. These are traditionally scheduled in fall with Big Sweep and in spring with the Durham Earth Day Festival.

Some specifics on what was accomplished during the fiscal year include:

- Supported 8 active Adopt-a-Stream groups. Held first ever Adopt-a-Stream training for volunteers. Held additional Adopt-a-Stream educator training at which teachers received water quality monitoring equipment to use with students.
- Enrolled 12 businesses in Durham EnviroStars business training and recognition program.
- Environmental Affairs Board met twelve times. The EAB is implementing a program to track environmental quality trends, including trends in water quality. The EAB was awarded, along with Stormwater Services, a \$1,500 grant to provide ten educators with water quality monitoring equipment. As part of the grant, educators enrolled in the City's Adopt-a-Stream program.

- The 2006 Durham Litter Index, led by Keep Durham Beautiful, indicated that the number of streets considered "Littered" and "Extremely Littered" are down 25% compared to the 2005 Index. The results indicate that the efforts of the litter crew, street sweepers and heavy equipment used for removing illegal dumping and illegal set-outs, is having a significant impact on community appearance.
- Storm drain identification projects: 145 stickers applied by 65 volunteers.
- The City sponsored stream clean-ups in conjunction with NC Big Sweep and the Durham Earth Day Festival. A total of 260 volunteers collected an estimated 9000 lbs. of trash at 15 sites.

Public Involvement and Participation Summary

- Adopt-a-Stream
- Business recognition and training
- Environmental Affairs Board (citizen's advisory panel)
- Keep Durham Beautiful (including Adopt-a-Street)
- Storm drain marking
- Stormwater hotline
- Stream clean-ups

Illicit Discharge Detection and Elimination (IDDE) Program

Legal Authority: The City revised the enforcement component of its illicit discharge products during the fiscal year. The prior ordinance prohibited discharges that impacted water quality. Staff had been able to obtain compliance with pollution control and pollution prevention objectives in many cases using education and threat of enforcement. However, the need to document adverse impact slowed investigations and in some cases impeded enforcement. Implementing a more comprehensive, effective and efficient program, required changes in procedures as well as changes in ordinance provisions.

In July 2006 an Assistant City Attorney conducted a seminar on right-of-entry and administrative search warrants for Stormwater staff. Stormwater staff compiled alternative ordinance provisions and drafted a preliminary list of ordinance provisions. The City Attorney's office worked with Stormwater staff and drafted a revised ordinance.

In November 2006, City Council adopted the Stormwater Management and Pollution Control ordinance which revises and more clearly defines prohibited non-stormwater discharges, requires certain preventative measures like secondary containment, and provides for escalated enforcement when necessary to achieve compliance. The ordinance includes specific pollution prevention requirements for facilities engaged in automotive service and automotive salvage. A copy of the adopted ordinance was submitted for review and comment to the Stormwater and General Permits Unit, DWQ, NCDENR on December 20, 2006. A link to the new ordinance is posted on the City's website: <http://www.durhamnc.gov/stormwater>.

An initial Enforcement Guidance document was completed in May 2007 and will be undergoing revision and update based on experience gained in conducting escalated compliance and enforcement actions under the ordinance.

Ordinance Education: Several mechanisms were used to begin educating the public about the new ordinance. The January/February issue of "Waterways" (Durham's bi-annual newsletter on stormwater issues) highlights key features of the ordinance and explains them in layman's terms

(<http://www.durhamnc.gov/departments/works/pdf/waterways0207.pdf>)

This issue of Waterways was distributed in stormwater bills to inform the general public of the new requirements.

For specific target audiences, flyers were developed covering automotive service, yard wastes, and mobile cleaning. For apartment complexes, a bilingual English-Spanish educational flyer was prepared to distribute to residents and tenants to explain the new regulations ("Nuevas Reglas para la Precipitación Pluvial, para residentes de departamentos".) In July, 2007 a consultant produced a Spanish language translation of the ordinance.

A staff member attended a meeting of the independent Garage Owner's Association to discuss the requirements pertaining to businesses involved in automotive service. The water quality investigations database was reviewed to identify possible recurring or unresolved concerns and letters were sent to those involved together with a copy of the ordinance and other explanatory information. Additional information on efforts to educate and target specific audiences regarding the ordinance changes are discussed below in the sections pertaining to Industrial and Related Facilities Program and to Commercial and Residential Program.

The City continues to maintain and actively publicize a pollution reporting hotline, as described above in the section of this report on Public Involvement.

Mapping:

The City is developing maps of various features in a Geographic Information System or GIS to support stormwater management, including illicit discharge. When an illicit discharge has been detected maps can help identify the source and to assess probable extent of impacts. Map layers have been developed for a large number of features, only part of which is discussed below.

Topography and Hydrology - The City has developed detailed topography and hydrology GIS layers showing surface drainage based on recent aerial photogrammetry. Topography shows 2 foot contours. Hydrology layers show swales, ditches, creeks, streams and rivers. In addition, the City has digitized versions of USGS hydrology for Durham County at 100K and 24K scales available in GIS, as well as USGS NHD hydrology that provides less detail but which extends further upstream.

The City has obtained delineated drainage of major streams (watersheds) within Durham County. The maps were based on USGS topography. The City has developed a modified version that has been updated in and around the City using the City's detailed topography and incorporating the drainage of existing storm sewers systems (sewer shed). Where a watershed extends upstream beyond county boundaries, the NHD has been used to extend the delineation.

To support on-going need for delineation work, the City intends to develop a Digital Elevation Model (DEM) based on existing LIDAR data from the recent floodplain mapping within the City. This DEM will be 'conditioned' to reflect culverts crossing road embankments, and to reflect delineated stream sewer sheds. The City will use automated delineation to facilitate mapping of smaller drainage areas in industrial areas.

Stormwater Management - There are no major stormwater structural controls in Durham. There are a large number of BMPs within the City installed within the last decade or so to treat stormwater runoff under state rules and/or provide detention as required by City ordinance. The City has developed a GIS map of more than 400 structures, with the initial mapping based on the parcel in which the BMP was located. The City is collecting more detailed location information as part of its inventory and mapping of new development. Furthermore, the City has added staff to inspect older BMPs and will be collecting more detailed location of existing BMPs as part of that process.

Stormwater System Map – The City has a GIS-based inventory and map of the stormwater piping system on public and private property within the City. The City has continued to update the information in the geodatabase to capture new development, as well as to capture features not included in the original inventory.

Sanitary Sewer System Map – The City now has a GIS map of its sanitary sewer system, developed by consultants based on 'as-built' drawings of sewer lines from developers as well as sewer lines installed by the City. Pipe inverts elevations are available for approximately 70% of the pipes.

Aerial Imagery - The City acquired detailed color aerial orthophotography in 2006 (resolution equivalent to 6-inch pixel). The City also has detailed aerial orthophotography available for other dates, including black and white aerial photos from 1988, 1994, and 1999, and color aerial photos from 2002.

In addition to the detailed orthophotos, the City has obtained color satellite imagery for 2005 and 2006 which is being used to update parcel-based impervious surface areas and percentages to support stormwater billing. This wide range of imagery is useful in mapping growth, correcting and updating billing records, evaluating buffer violations, and assessing and investigating illicit discharges.

Land Use - The City's GIS system includes several different layers showing land use. The parcel geodatabase includes very detailed land use at the parcel level.

Periodically this detailed information is generalized and aggregated into an existing land use map. Local area plans and other resources are used to develop future land use maps. The City also has geodatabase layers showing parks, City owned land, publicly owned land, and street rights-of-way.

Other Potential Pollutant Sources - While the City already had a map of NPDES permitted discharges in Durham, the number is constantly changing. New permits are issued for discharging residential wastewater systems and for industrial stormwater discharges. During the summer of 2004 the City obtained an updated listing of permits issued in Durham and has developed a GIS mapping of those locations based on the street address provided in the permit database. In 2005 the City obtained a list of discharging residential wastewater systems, developed a map of the location, and provided a list to the NC Division of Water Quality to issue NPDES permits. In 2007 the City developed a list and map of potential automobile salvage yards, developed a mass-mailing, and provided property ownership information to the NC Division of Water Quality to issue NPDES permits. The City updated mapping of Hazardous Waste Treatment Storage and Disposal (HWTSD) facilities in Durham County, determining that none of the facilities are in the City. Wastewater treatment plants, water treatment plants and known solid waste landfills have been mapped.

City staff has been trying to acquire a database of facilities reporting releases to the environment (Toxic Release Inventory) and facilities that handle hazardous materials or that generate hazardous waste. We have had difficulty determining how to obtain data other than from the US Environmental Protection Agency.

Activities: A summary of the investigations and findings of the illicit discharge detection and elimination program is summarized below for FY 07.

- For the fiscal year, 187 water quality investigations were conducted. 130 water quality problems (or potential problems) were identified. To assess progress toward compliance staff also conducted 170 follow-up investigations.
- A summary of the water quality problems found through the illicit discharge program, organized by watershed and by problem type, may be found in **Table 3**, found in the appendix of this annual report.
- For the fiscal year, 37 Notices of Violation were issued. This number is lower than in the past as a result of the greater specificity of the City's revised illicit discharge ordinance, requiring distinctions between ordinance violations and poor practice.
- Reports to the City regarding erosion and sediment concerns decreased again in FY07 to 5 from 14 the previous year. There were no investigations regarding discharge of laundry wash water during FY07, compared to 9 the previous year.
- There was little change in the numbers of concerns reported in many categories compared to the previous year, including: illicit connections; discharge or improper storage of petroleum products; improper disposal of food/grease/cooking oil; improper disposal of yard wastes; and discharges from private sewer laterals.

- Investigation related to sanitary sewer overflow, and other discharges from the collection system increased significantly compared to the previous year, as did water quality concerns related to on-site wastewater treatment.
- There was a significant decline in the “other” category, which includes improper housekeeping, trash, leaks from the potable water system, etc.
- The revised illicit discharge ordinance has refocused enforcement.
- Of the investigations that were conducted, 16 were initiated by Stormwater Services staff, 75 were initiated by calls from other city staff, and 5 came from other local government agencies. Of the water quality investigations initiated by calls from citizens, 54 came from day-time phone calls and 22 from calls to the automated 24-hour hotline.
- Staff devoted an average of 1.0 hours to conducting initial investigations. During the year, emphasis was placed on responding rapidly only in those cases that seemed to require it (e.g. major spills, odor complaints indicating possible sewer overflow, intermittent discharges) and monthly average response time (from time called to time investigators arrived on site) increased to an average of 0.45 working days as a result. The changed emphasis allows staff to be more efficient in scheduling lower priority investigations. Once a source was identified and located, letters or notices of violation were issued in an average of 1.9 business days.
- The City continued to develop and use GIS mapping to facilitate and support illicit discharge investigations. Mapping of the stormwater and surface waters is reported in the section: Stormwater System Inspection, Maintenance and Improvement. Mapping of potential sources of pollution is reported in the section on the City’s Commercial and Residential Program. The City has land use, topography, planimetrics, impervious surfaces, detailed color aerial photogrammetry for 2005, color satellite imagery for 2006 and 2007, parcel ownership, water system, sewer system, and other GIS resources used in illicit discharge investigations.
- Using the findings from the IDDE program, the City has begun to develop a GIS layer of the locations of known sewage discharges since 2001, including failing septic systems, SSOs, and discharges from private service sewers.

Staff development and training during the year included:

- EPA webcast: Conducting Illicit Discharge Detection and Elimination Programs (IDDE 101),
- EPA webcast: Pollution Prevention for Municipal Operations.

FY07 has been a transitional year in the illicit discharge program. In years past, notices of violation might have been issued for poor housekeeping practices, or without firm evidence of who committed a violation. Because emphasis is now being placed on enforcement, notices of violation will no longer be issued for vague or potential threats to water quality, such as poor housekeeping. The ordinance does impose affirmative housekeeping requirements to provide secondary containment and to clean up spills that will be enforced. These changes will impact certain categories of violations. Also, as staff gains experience with building enforcement cases and working with the legal process, procedures will be refined.

In the coming fiscal year, the City expects to add staff to conduct dry weather screening at stormwater outfalls. The City will continue to develop and implement map resources to facilitate IDDE, including land use, and will acquire pen-tablet computers for the two trucks so that GIS

mapping resources are available in the field during investigations. As indicated below, significant efforts will be made to bring certain automotive service facilities and auto salvage yards into compliance with practices required in the revised illicit discharge ordinance.

IDDE Summary

- Operate household hazardous waste collection center
- Identify and eliminate illicit connections & discharges
- Inspect industrial/commercial sites with NPDES permits
- Operate pollution reporting hotline
- Respond to spills & dumping
- Monitor remediation of sanitary sewer overflows
- Map sewer overflows
- Monitor water quality and detect spills
- Mapping and inventory of storm sewers
- Delineation of watersheds, sub-watersheds and catchments
- Detailed mapping of surface hydrology, topography, impervious surfaces
- Mapping of sanitary sewer system – under development
- Mapping of potential sources of pollution
- Stream walking & dry weather flow inspection – Little Lick Creek
- Respond to citizen requests/complaints
- Inform/educate commercial facility owners as part of complaint response
- Follow-up on water quality monitoring results

Sediment and Erosion Control Program Construction Site Runoff Program

As described below construction site runoff within the City of Durham is regulated through several entities.

Construction site runoff from privately funded development is controlled under provisions of a Unified Development Ordinance (UDO) adopted by both the City of Durham and the County of Durham. As provided in Section 3.8.1 of the UDO, the ordinance applies to certain land disturbing activities anywhere with Durham County, including the City of Durham, and is enforced by the Durham County Sedimentation and Erosion (S & E) Control Officer. The Durham County program is further delegated and authorized by the North Carolina Division of Land Quality. The S & E Officer directs a program that issues permits, reviews erosion control plans, conducts site inspections and carries out enforcement actions to enforce local S & E requirements in Section 3 of the UDO. The UDO requires a permit where more than 12,000 square feet of land will be disturbed, and further requires an approved erosion control plan (1) where more than one acre will be disturbed, (2) in water quality critical areas and water quality basin areas, where more than 12,000 feet will be disturbed, and (3) conditionally for any other land-disturbing activity when off-site damage is occurring, or if the potential for significant off-site damage exists. Additionally, a plan and permit may be required when the applicant, or a parent, subsidiary, or other affiliate of the applicant, has previously conducted land-disturbing activity without a required permit or has engaged in the other activities enumerated in Sec. 3.8.7. Under state law, certain practices are not subject to

such local approvals (e.g. mining, forestry, agriculture, and government funded development projects.)

Under state law, projects constructed using public funds are reviewed and inspected by the North Carolina Division of Land Quality, Land Resources Section, except that the North Carolina Department of Transportation projects implements a program of self-review and monitoring for S & E controls.

Development sites that disturb more than one acre are also subject to the state's general NPDES permit for construction activities, NCG010000 unless a project has obtained other NPDES stormwater permit coverage for the construction activities. The submission of a proposed Erosion and Sedimentation Control Plan to the Division of Land Resources or delegated local program is considered equivalent to a Notice of Intent for coverage under the General Permit, and general permit coverage begins upon issuance of approval for the S & E plan.

The Durham County Sedimentation and Erosion Control Program covers all non-publicly funded land development projects (the majority of projects) within the City. The County program has continued to improve staff training, to conduct workshops for contractors, and to implement modified requirements and procedures. At the beginning of FY07, the program increased fees, tightened requirements for temporary seeding following grading, and announced phasing requirements as outlined in the state's newly revised Sediment Control Design Manual. The program revised design criteria for the control orifice in surface skimmers, and during the year began promoting increased use of surface skimmers or baffles to improve the performance of sediment basins. The program also clarified that tree-cutting at land development sites is considered a land-disturbing activity for purposes of applying S & E requirements.

During rezoning, conditions were placed on several projects requiring the use Polyacrylamides (PAM) to improve control of turbidity. Inspectors report visiting active sites at least monthly, with more frequent visits made to sites with compliance or maintenance issues.

As one means of monitoring the effectiveness of these programs and supplementing their enforcement activities, the City conducts investigations in response to hotline complaints, citizen concerns, staff observations, and impacts observed in routine monthly stream monitoring related to S & E. These investigations are tracked in the City's illicit discharge database. Any apparent compliance issues are referred to the appropriate agency for enforcement. Compliance with an NPDES permit is deemed to be compliance with the City's revised illicit discharge ordinance; where a construction site fails to comply with NCG010000, the City will conduct independent enforcement where impacts warrant. As reported in the section on illicit discharges, the number of complaints received by City of Durham Stormwater Services has declined each of the last two fiscal years.

Construction Site Summary

- Plan review

- Monthly Site Inspections
- Distribute educational material
- Hotline (City)
- Respond to citizens' reports (City & County)
- Local Ordinance
- Permit required for land disturbance of 12,000 square feet or more.

Development and Re-development Program Post-Construction Program

Durham currently enforces post-construction requirements under two different state authorities that are separate from our NPDES program. Water Supply Watershed Protection and Neuse Stormwater Management programs together cover approximately 65 percent of the City.

Additional post-construction requirements have been included in the City's forthcoming permit. The City will be required to adopt new post-construction requirements applicable in the 35% of the City not currently covered by such requirements. In areas currently covered by Water Supply Watershed and Neuse Stormwater Management Programs, those programs will be deemed to meet the post-construction requirement, and thus the implementation of those programs will become requirements of the City's NPDES permit. In anticipation of these changes, below is a status summary on current state-mandated programs. We are providing the information below to help us transition to meeting future NPDES post-construction requirements by communicating with regulatory authorities and soliciting comments and recommendation on how this program is developing and how activity is being tracked. Additional information will be provided in our next annual report.

- The City continued to develop a GIS layer of BMPs in Durham. New structures are being picked up during the field work to capture new stormwater piping. The layer now contains 401 BMPs; in many cases the point location now identifies the riser structure or outlet of the BMP.
- Maintenance agreements were executed for 68 BMPs during FY07. During the same period, the City received 65 as-built submittals, some of which were re-submittals, for acceptance evaluation. City engineers conducted 335 site visits to evaluate BMP construction. As a result of poor attention by contractors and inadequate construction oversight by design engineers City engineers accepted only 10 as-built drawings during FY07. Certificates of occupancy will not be issued until construction defects are corrected, the BMPs meets design intent, and the as-built drawings adequately reflect the BMP as it was constructed.
- During FY07 the City added an engineering position, a technician position and an administrative assistant in order to enhance the ability to manage the assessment of the backlog of existing BMPs on private property, and track execution of agreements with property owners. The BMP Assessments workgroup acquired a pole camera video system to supplement existing resources for assessing pipes, risers, and other structures. Staff conducted 209 assessments of existing BMPs, including 122 maintenance re-assessments. Improper construction, lack of

maintenance by owners, and possibly poor understanding of maintenance needs has contributed to the high rate of re-assessments, but the rate is expected to decline over time as more existing facilities are brought up to standards and new facilities are properly constructed.

- During FY07 the City continued to enhance the process of certifying final construction of new BMPs. City staff conducted field review and acceptance of As-Built drawings of BMPs for 65 development projects with all deficiencies required to be corrected prior to acceptance of the BMP or issuance of final Certificates of Occupancy.
- Between new and existing BMPs, a total of 476 stormwater facility assessments were conducted during FY07.

Staff training during the year included:

- Paul Wiebke and Sandra Wilbur attended a one-and ½ day workshop “Advanced Stormwater BMP design: Ask the Researcher,” December, 2006.
- David Brown, Jacob Chandler, and Paul Wiebke attended the 3-day 2nd National Low Impact Development Conference in March, 2007
- Most stormwater design & O&M staff participated in two webcasts by the American Public Works Association, the first on Effective Stormwater BMP Design and Maintenance in April 2007, and the second on Low Impact Development held in June 2007.
- John Cox attended a Retrofit BMP tour in Charlotte.

Staff conducted two (2) workshops to train stormwater design engineers and developers covering issues related to the City’s design and submission requirements for stormwater detention and treatment BMPs and also addressing the Operation and Maintenance Agreements and surety process that ensures subsequent maintenance is performed by owners.

- Held 3 workshops for the development community on BMP design and maintenance, construction requirements, and LID. A total of 107 professionals participated.

Drainage, Infrastructure, and Floodplain Management

Floodplain Management

- FEMA completed the review and release of the Digital GIS data for the DFIRMs. Upon receipt of the digital data the FEMA coverage was added to the City’s online mapping application. Additionally, the City created a FIRM atlas interface that enables the public to view and download PDF’s of the DFIRMs from the City’s web page.
- FEMA is reviewing a Physical Map Revision for the tributaries of Third Fork Creek that is expected to go into effect early in FY08. In response to requests from the Grove Park community the City submitted a request for a Letter of Map Revision for Little Lick Creek and Little Lick Creek Tributary 1B.
- Stormwater Services Division staff responded to 540 requests for FEMA floodplain information.

- The City continued to identify flooding issues. From staff investigations it was determined that most such issues are the result of inadequate capacity or aging infrastructure on private property.
- City Stormwater Maintenance crews conducted maintenance to remove debris at 105 locations involving a total of 7,500 feet of stream.

Stormwater System Inspection, Maintenance and Improvement

Municipal Stormwater System - The City of Durham owns and operates the stormwater system within street rights-of-way and on City property.

- During fiscal year 07 on average the City swept downtown streets 1.3 times per week and other streets once every 7.2 weeks. Street sweeping operations swept **13,200** curb miles (an 8% increase) and collected **3,380** tons of debris (a 16% decrease). **390** tons of litter was collected by hand.
- The tops of catch basins and other street inlets are inspected and cleaned during street sweeping. In addition, Stormwater Maintenance vacuumed 502 catch basins and other storm drain inlets during FY07.
- City Stormwater Maintenance crews replaced 1,003 storm drain covers within the ROW. A considerable amount of this work was in response to problems with covers that were broken or stolen. The City specification for basin covers is being revised to require better material standards. City Maintenance staff worked with the Police Department and media in an effort to catch the persons responsible for and prevent future occurrences of theft of drainage basin covers.
- City Stormwater Maintenance crews conducted video inspection inside stormwater pipe systems at four locations totaling 437 linear feet of pipe.
- City Stormwater Maintenance crews pulled or re-graded 55,170 linear feet of roadside ditches at a cost of \$51,075.
- City Stormwater Maintenance crews received 985 service requests involving stormwater related concerns that resulted in 363 work orders to maintain and repair drainage systems within the City Right-Of-Way (ROW.) Of these requests 105 were initially investigated by Stormwater Services staff and referred to the Maintenance Division as they involved drainage within the ROW.
- During FY07 Stormwater Maintenance completed 1,364 repair work orders on the City's stormwater infrastructure at a cost of \$644,000.
- A project to map and inventory the stormwater system within the City of Durham was completed over the period 1999 to 2003 by an outside vendor. The City is in the process of updating the map and database inventory, and has two staff members dedicated to update and maintenance. The inventory is housed in an enterprise GIS database and has been made available to the public on the City's online mapping application. The inventory itself is comprised of both closed system structures (drains and pipes) as well as open channel features (streams, ditches, etc.). Storm water infrastructure is collected in the field (when possible) using survey grade GPS. Attribute information collected includes types, sizes, depths, materials, and condition; potential illicit discharges are referred for further investigation. The inventory extends beyond the MS4 to include inlets and pipes on private property.
- The inventory currently includes 29,434 curb, drop and combination inlets, typically located in private and public parking lots, city streets, and state highways. The

inventory also includes 923 slab inlets draining pervious areas, and 15,225 end sections, some of which are inlets and some outlets. An additional 4,041 stormwater structures are associated with manholes, pipe junctions, and other structures. The inventory currently includes 661.7 miles of pipe. A rough evaluation indicates that 51% of structures and 54% of pipes are MS4, including both NCDOT and City of Durham MS4.

- The City has previously mapped parcels containing structural BMPs, and is now adding to the inventory the location of riser outlet structures associated with structural BMPs. Virtually all such BMPs are located on private property, constructed as part of land development projects.

Private drainage systems

- City Stormwater Services staff responded to 404 drainage service requests involving private property drainage issues.
- The City completed 47 remedial maintenance drainage projects involving private property at a cost of \$403,486, and an average cost per project of \$8,000.
- During this fiscal year 21 new private property drainage problem areas (Priority 1, 2 or 3) were added to the priority list. The City began the fiscal year with 734 private property drainage problem areas on the list and ended the year with 655 problem areas on the list. [Note that a drainage problem area may extend over several parcels, and that each parcel where drainage work was completed is tracked as a project.]

Capital Improvement Program Projects

- The City began design in FY07 for the University Drive Drainage System Rerouting Project to correct a partially collapsed major culvert underneath a strip shopping center building. The project design phase should be completed by the end of this calendar year and the contract should be under contract by the end of FY08.
- The City completed the preliminary analysis and chose a project option for the repair of a failing major drainage system through property at 808 W. Trinity Ave. The project will involve pipe replacement under an existing parking lot and day lighting the remainder of the system. The design phase should be substantially complete in FY08.
- The City is also negotiating with a developer to increase drainage system capacity in Pratt Street and Douglas Street to remediate surcharging. Construction should begin in FY08.
- In FY08 the City also will be working on the design of a drainage system upgrade for Chesapeake Avenue.
- The City's CIP for FY08 also includes a line item to cover major work on City Rights-of-way and other City property (essentially the City's MS4).

Pollution Prevention and Good Housekeeping for Municipal Operations

Municipal-Industrial Operations

During FY06 the focus was on obtaining NPDES Industrial Stormwater Permits for municipally owned industrial operations, while in FY07 the focus has been on developing initial Stormwater Pollution Prevention Plans (SWPPPs) for these facilities. The City's industrial inspector has been serving as a resource to assist the City's municipal industrial facilities in developing SWPPPs and assessing appropriate BMPs. Each facility was provided with appropriate example SWPPPs and other guidance documents. Development of a SWPPP is an iterative process involving planning, implementation, assessment and process improvement. Two facilities were just completing their SWPPP at the end of the fiscal year, and are likely to need continued assistance during the coming fiscal year. **Table 4** in the appendix lists the facilities, their Certificate of Coverage (COC) or permit numbers, coverage dates, and contact information.

Stormwater Services has conducted training of staff at the three city-operated transportation-related facilities, and has provided training materials to staff at the wastewater facilities. Stormwater Services also conducted spot inspections at all of these facilities. Stormwater Services has also provided guidance documents and representative example SWPPP documents to all facilities to use in developing their programs, including specific examples of wastewater and transportation SWPPPs. By the end of FY07, Stormwater Services had provided review comments to each of the city operated facilities regarding their Stormwater Pollution Prevention Plans (SWPPP). Stormwater Services will continue to periodically assess both implementation and effectiveness, and to recommend further revisions as necessary to control pollutants.

During the coming fiscal year the Stormwater Industrial Inspector will continue to provide assistance to the City operated facilities and spot inspection of the DATA facility. For city-operated facilities the inspector will offer assistance in staff training and will use the periodic spot inspections to evaluate implementation and effectiveness, and will recommend revisions of the plans to assist facilities in compliance. NCG08 is scheduled to expire two months into the coming fiscal year, and Stormwater Services staff will advise the three impacted city operations of any changes in conditions and requirements under any new general permit.

During the coming year, the City will identify other municipal facilities that should develop SWPPPs and begin working with those facilities.

Training Sessions:

- 8/9/06 Fleet Maintenance Staff: Overview of NPDES Program/SWPPPs
- 9/12/06 Fleet Maintenance Staff: Conducting Outfall Sampling
- 5/1/06 PWOC Staff and Solid Waste Staff: Overview of NPDES Program/SWPPPs and Conducting Outfall Sampling

In addition to training of staff at the impacted facilities, Stormwater Services staff internal development and training during the year included:

- EPA web-cast on Pollution Prevention for Municipal Operations
- See also training in industrial inspections reported below.

Program to Control Pollutants in Stormwater Discharges to the Municipal Stormwater System

(See also the illicit discharge and street sweeping reported elsewhere in this report.)

General staff development and training during the year included:

- EPA web-cast Pollution Prevention for Municipal Operations.
- EPA web-cast on EPA's Watershed Plan Builder tool.

Other training is summarized below.

Industrial and Related Facilities Program

During FY07 Stormwater Services filled a newly authorized position for a dedicated industrial inspector to inspect the most critical facilities. Training materials from other municipalities were reviewed. The inspector developed an MS Access database to track each facility and allow tracking of inspections. The industrial inspector works in coordination with the City's industrial pretreatment coordinator.

Determining which facilities to inspect has turned out to be more difficult than one might expect. Many industrial facilities in Durham County are located outside the City of Durham. For example, Research Triangle Park (RTP) is largely bordered by the City on two sides but is not subject to annexation. Furthermore, the City does not exert authority over an ETJ. Mailing addresses may list RTP, NC, but this has not been reliable for determining what is located in RTP.

To identify facilities within the City, industrial facilities in Durham and RTP were identified using several sources of information. Several targeted mailings were used to solicit information from selected sectors. A status summary is provided in **Table 5** below.

During the last three quarters, 18 privately-owned industrial facilities were inspected, including high priority facilities such as GE Aircraft, Brenntag, SCM Metals, Cree, Erwin Oil, Triumph Boats, and six automobile dealers, as well as the five City operations and one private operation on City property that have industrial facilities described above.

A total of 31 inspections were conducted.

Commercial facilities will continue to be inspected by inspectors with the City's Fire Prevention and Hazardous Materials Program. Fire inspectors annually inspect every building in the City, including apartment buildings, office buildings, and commercial establishments. The stormwater component of the Fire Inspection program will be modified to screen commercial facilities and to serve as a feeder, identifying additional industrial facilities that may need industrial inspections. During FY08, the Stormwater Industrial Inspector will work with and train Inspectors with the Fire Department to identify additional facilities requiring inspection.

The auto salvage industry will be a point of emphasis for FY08. Despite efforts by the Raleigh Regional Office of the NC Division of Water Quality to inspect such facilities and require them to obtain permits, many properties that have junk cars have not obtained an NPDES industrial stormwater permit from the state; in some cases such facilities assert they are not salvage operations. In November 2006 the City adopted requirements that all facilities having more than ten junk cars develop and implement Stormwater Pollution Prevention Plans. The ordinance requires that facilities having 30 or more junk cars develop a SWPPP by September 1, 2007, while facilities that have between 10 and 29 such vehicles have until February 1, 2008. The City is currently using GIS Map resources to identify properties to which the requirements may apply, and will conduct a mass-mailing to property owners to advise them of the requirements. Identified properties will be inspected during FY08. It is expected that some properties will remove junk cars in order to avoid these regulations, while others will develop and implement procedures to minimize impacts.

Stormwater Services staff development and training during the year included:

- Reviewing a 2-DVD training video on Industrial Inspections from the Riverside Regional Water Quality Control Board, California.
- Reviewing five different industrial inspection forms prior to developing our own forms and database.
- Obtaining a PowerPoint presentation developed by the City of Memphis to provide training on Industrial Pollution Prevention and adapting it to North Carolina and Durham, adding additional photos and information.
- Obtaining a copy of Michigan DEQ's Industrial Stormwater Training Manual and adapting it to North Carolina and Durham.
- See also the EPA web-cast on Pollution Prevention for Municipal Operations discussed above.

For the coming year a major point of emphasis in the inspections program will be automobile salvage yards. The City will use GIS resources to identify automotive salvage yards. The GIS study will use planimetrics, recent aerial photography, and parcel land use information to identify possible targets. The City will send letters to property owners and will send follow-up letters to lessees identified by the property owners. The letters will explain the City's requirements for developing Stormwater Pollution Prevention Plans, and will also reference federal and state requirements.

Commercial and Residential Program

- The City's illicit discharge program and the City's stormwater education program are major components of the City's efforts to address commercial and residential sources of pollution. These programs are covered in separate parts of this annual report.
- At a monthly meeting of the *Independent Garage Owners Association*, staff made a presentation and provided handout materials regarding requirements in the City's new illicit discharge ordinance that are applicable to businesses engaged in automotive maintenance.

- The City's household hazardous waste collection center took in a total of 426,342 pounds during FY07, including 154,717 pounds of electronic waste and 251,317 pounds of household hazardous materials, a 15% decrease over the previous year. Of the total, 93.2% was recycled, including paints, electronics, flammable liquids, lead batteries, and fluorescent tubes. 44% of the 29,109 pounds of waste that was disposed consisted of solid or liquid pesticide or herbicide. Total cost of the program was \$215,073.30
- Roadside manual litter collection picked up 389 tons of litter. City crews picked up 2,331 dead animals from City streets, and 1744 from Veterinary Hospitals.
- In 2004 the City obtained an updated database list of NPDES permits in Durham County and geocoded the lists to update GIS maps of potential sources of pollution. The list includes industrial stormwater permits, groundwater remediation treatment system discharges, and individual residential wastewater treatment system permits for discharging septic-sand filter systems. The City is exploring whether it will be possible to use NCDENR's BasinWide Information Management System (BIMS) on-line application to update the list of permits, including location information.
- The City obtained a database from the health department on septic-sand filter systems in Durham County and geocoded the data to identify the locations. A comparison with the list of systems permitted as of 2004 indicates that less than 20% of septic-sand filter systems had permits, and that most such systems are located in Durham County, outside the City's jurisdiction.
- The City's illicit discharge program focused significant efforts on facilities engaged in automotive maintenance. The new car dealers we have inspected are performing well; they have dedicated facilities for washing vehicles, store all fluids and parts indoors away from precipitation and runoff, and clean up spills, drips and leaks, appropriately disposing of the absorbent. Many smaller automotive service facilities also work hard at pollution prevention, recycling oil filters in addition to oil and other fluids. However, a few, mostly smaller automotive service facilities located in certain parts of the City have been storing fluids and oily parts outside, washing vehicles outside, and failing to clean up spilled materials. Adoption of a new illicit discharge ordinance and development of an administrative enforcement guide is giving the City additional tools to address these problem facilities. During the coming year compliance at smaller automotive service facilities will continue to be a point of emphasis.

Pollution Prevention Summary

- Yard waste collection
- Recycling Program
- Household hazardous waste center
- Street Sweeping
- GIS mapping of sources

Water Quality Assessment and Monitoring

Stream Monitoring

Durham conducted water quality monitoring as summarized below during **FY 07**.

- Biological monitoring:
 - For the last six years the City has conducted full, DWQ-type biological assessments, monitoring benthic macroinvertebrates. The City relies more heavily on the NCBI rating than the EPT diversity rating (note: lower NCBI = better water quality). EPT diversity in Durham's urban streams is impacted by factors unrelated to water quality, with Triassic Basin clay soils resulting in naturally low base flow and lack of diversity in aquatic microhabitat. Furthermore, the City's monitoring stations are further upstream than those monitored by the state on segments with less reliable flow, which generally reduces diversity. The results of the most recent monitoring are summarized in **Table 6** in the appendix.
 - We have discontinued referring to the two Eno River sites as reference sites. While the area that drains to the upper site itself is largely undeveloped, one site is now subject to high use, with visitors wading in the water and moving the rock and cobble around to form pools. Both Eno sites are subject to runoff from local development. We anticipate continued monitoring for the near term in order to document the impacts of habitat disturbance. With this change in designation, during the fiscal year, the City monitored sixteen sites to evaluate human influences, and three sites used as references.
 - Samples could not be collected at three sites because of lack of flow. While the summer of 2006 was not as dry as previous droughts, it does appear that seasonal drought may have impacted ratings, with 2 of the 3 reference sites showing decline in NCBI compared to the previous year.
 - A rating of Good-Fair indicates the stream is providing sufficient aquatic life support to meet water quality standards. All of the reference sites monitored had at least a Good-Fair rating. For urban stream sites, the NCBI indicated fair for six sites and poor for four sites, indicating that all have at least some impairment.
 - Trends:
 - Two of the three reference sites appeared to indicate water quality getting worse (higher NCBI) -presumably impacted by dry conditions.
 - Both of the Eno sites seemed to indicate water quality getting worse as well
 - Five of the urban sites showed water quality improving (lower NCBI) while three sites indicated a decline in water quality.
 - The City has provided a copy of our draft Standard Operating Procedures Manual for Benthic Monitoring to the Biological Assessment Unit of the NC Division of Water Quality for preliminary review and comments as a step toward seeking certification of our benthic laboratory in FY08.
 - Four members of the City's staff have been certified for collection of benthic macroinvertebrates by the North Carolina 401 program.
 - Professional development, continuing education and process improvement: During the year, (1) four staff members again attended the Carolina Area Benthological Workshop (CABW); (2) the benthic lab supervisor and assistant lab supervisor assisted Dave Penrose of North Carolina State University in conducting an introductory two-day workshop entitled: "Introduction to Taxonomy and Pollution Ecology of Aquatic Insects;" (3) and the lab supervisor and assistant lab supervisor served on a national committee for the North American

Benthological Society (NABS), facilitating and arranging the taxonomy workshop that provides certified sample identification for reference collections used by working taxonomists. Information gained as a result of direct contact with national experts has resulted in significant improvements in efficiency while maintaining a high level of accuracy.

- Long-term ambient monitoring.
 - The City currently began sampling monthly on a fixed schedule in January 2004 in order to more closely simulate the sampling performed by the NC Division of Water Quality. During the fiscal year, the City collected samples every month except for April 2007, when sampling was skipped to reduce work load for other program activities. Each month 36 samples were collected, including QA samples, except for several sites that were dry. Results are summarized in **Table 7** in the appendix. All stations are monitored for field parameters, and samples are collected for laboratory analysis of fecal coliforms, the parameter mostly to indicate impairment and to identify locations subject to illicit discharges. At more than half of the stations, lab samples are also collected for nutrients, BOD, TSS and selected metals. Some of the cells in **Table 7** are gray because BOD, TSS and metals are not sampled at all sites.
 - Unlike the previous year, the three true reference sites and the two Eno quasi-reference sites all met water quality standards for fecal coliforms and dissolved oxygen. Some of the difference may be the result of changes in weather pattern, but some may be due to improvements in monitoring to better represent conditions in the water column. However, three rural sites on Panther Creek and Lick Creek continued to have exceedances.
 - Fecal coliform exceeds 400 cfu/100 ml in more than 20% of samples at nearly every urban stream site. Fecal coliform attaches to sediment and any disturbance of sediment will increase concentration in the water column. The City therefore focuses on geometric mean as an indicator; and the City's experience in lower Northeast indicates that it should be possible to keep the geometric mean close to, or below 200 if all of the sources can be identified and corrected. However, in some subwatersheds there are so many sources that this is a significant challenge.
 - The fall of 2006 was unusually warm, and the summer of 2007 has been unusually dry, whereas rainfall in 2005 was more normal. Discussions below compare the summary statistics shown in **Table 7** below with similar results for 2005.
 - For the urban sites, dissolved oxygen improved and some of the higher fecal coliform concentrations were abated compared to the previous year, possibly due in part to wetter conditions. Fecal coliform geometric mean exceeded 1,000 at 16% of sites, compared to 27% of sites the previous year. Dissolved oxygen was less than 4 mg/l more than 10% of the time at 32% of the urban sites, compared to 53% of the urban sites the previous year.
 - The highest concentration of fecal coliform is in South Ellerbe Creek (station EL8.5SEC) and Goose Creek both of which drain older developed areas near downtown. This is consistent with previous findings and also with the results in

the National Urban Runoff Program the poorest water quality is associated with the oldest development. Improvements are expected to continue in these areas as the City's Water Management Department continues to repair and replace old infrastructure. Stormwater Services anticipates adding two additional technicians in the coming fiscal year to conduct outfall screening that should help identify cross-connections and other private-property sources.

- Copper continues to be a pollutant of concern in Stirrup Iron Creek where dissolved copper exceed EPA recommended chronic criteria in 75% of samples. The source has been identified as stack emissions from an industrial facility, and the City has discussed the problem with both the Division of Air Quality and the Division of Water Quality.
- Water quality declined significantly in Rocky Branch Creek, a tributary of Lick Creek. Bacteria and turbidity increased. Dissolved oxygen did not improve at this location and BOD is very high compared to other sites. The tributary area is currently outside the City. The causes of impairment will likely be identified during ongoing development of a local watershed plan for Lick Creek.
- Northeast Creek was reported in last year's annual report as an area of remarkable improvement. In 2000, geometric mean for fecal coliforms was 259 cfu per 100 ml at Sedwick Road (Station NE0.0NE, SR1977) above the Durham County-Research Triangle WWTP. As a result of an intensive illicit discharge campaign, water quality has improved significantly in Northeast Creek. In 2005 the characteristic (geometric mean) fecal coliform concentration was 87 while last year it was 179 cfu per 100 ml, both of which are under the water quality standard of 200 for geometric mean. A Bacteria Source Tracking Study conducted after the source control measures indicated that most of the E. coli organisms are now from domestic and wild animals. The site is no longer considered a hotspot compared to other sites within the City. However, there appears to be a slight upward trend in fecal coliforms, which may be related to recent drought cycles or to new unidentified sources. Furthermore, it is recognized that although the geometric mean may be below 200 per 100 mL, the site continues to violate water quality standards because in both of the last two years more than 20% of samples exceeded 400 cfu per 100 ml.
- Another area of decline was New Hope Creek at Chapel Hill Road (NH3.0NHC, SR2220) where fecal coliforms again exceeded 200 after being below it the previous year.
- The sites with the poorest water quality tended to have high fecal coliforms accompanied by one or more of the following: dissolved oxygen violations, elevated biochemical oxygen demand, elevated total nitrogen, elevated total phosphorus, and in a few cases, elevated turbidity.
- Continued analysis supports the hypothesis that zinc is not a significant stressor. Copper continues to be a concern at selected locations, particularly Stirrup Iron Creek, and adjacent portions of Northeast Creek, but also in portions of Ellerbe Creek. At most urban stream sites, dissolved copper did not exceed EPA's chronic criteria for continuous exposure.
- In addition to the site-by-site trends discussed above, the City conducted trend analysis over the period 2004 to 2006, compositing all data for all urban stream

sites monitored. Scatter plots and trend lines were produced. This period was subject to at least two droughts. Furthermore, many water quality parameters vary seasonally. It was not possible to draw conclusions about trends because of seasonal variations and inter-annual climatic/drought variations. To minimize seasonal effects, the City needs to conduct ambient monitoring at regular intervals throughout the year; "trends" will continue to be evaluated by comparing annual summary statistics from one year to the next, as was done above. Such evaluations will be based on calendar year rather than fiscal year because the summer is usually the most critical period and data for any given summer period should not be split over two years. Keeping summer data together will facilitate accounting for variations in temperature and rainfall from year to year.

Local weather conditions, including 15 minute rainfall, are currently monitoring by a weather station located on the roof of City Hall. In addition, daily rainfall is also monitored at the South Durham Water Reclamation Facility.

Supplemental Note: the City's monitoring program does not include end-of-pipe monitoring, which was eliminated in favor of adding biological monitoring and enhancing ambient monitoring, as indicated in previous annual reports. These changes are in line with EPA guidance provided in its Interpretive Policy Memorandum on Reapplication Requirements for Municipal Separate Storm Sewer Systems (Federal Register volume 61, No. 155) and guidance from Division of Water Quality.

Water Quality Monitoring Summary

- Monitor representative sites each month
- Monitor benthos annually
- Stream level and flow monitored at three locations
- Rainfall gauge installed and monitored at two locations

Water Quality Restoration

- **Figure 1** (attached) shows a map and status list of stream restoration projects planned, under construction, or completed in Durham.
- During the year the City began participating in development of local watershed plans (LWPs) for Lick Creek, and for Northeast Creek. These LWPs include conducting stream assessments, identifying pollution sources, screening alternative control strategies, and identifying potential retrofit locations with the watershed. The City also selected a consultant to update the Ellerbe Creek LWP and to develop more detailed implementation plans for the watershed.
- During FY 07 the City continued to work with funding agencies and other parties to design and implement projects on Ellerbe Creek at Northgate Park and on Goose Creek. Duke University has completed restoring a 14 acre area on Sandy Creek.
- Staff continues to provide support for several NC Ecosystem Enhancement Program stream restoration projects.

- The City completed construction of a stream restoration and stormwater retrofit project at Durham Central Park in downtown Durham within walking distance of City Hall.
- Falls Lake has been designated as nutrient sensitive and is likely to be added to the 303d list of impaired waters for chlorophyll *a* and turbidity. City staff members for both the Water Management Department and the Stormwater Services Division of the Public Works Department actively participated in a technical advisory committee to guide the state's modeling and monitoring efforts that will develop a nutrient management plan and TMDL for Falls Lake.
- Jordan Lake has long been designated as nutrient sensitive, and a number of City staff members from the Stormwater Services Division and the Water Management Department have been actively participating in crafting of water quality plans for the lake. When Jordan Lake was developed in the early 1990s, it was not predicted to meet water quality standards, but was expected to support its uses, including aquatic life support and recreation. Shortly after being filled it was designated as nutrient sensitive. The Clean Water Responsibility Act of 1997 included effluent concentration limits on wastewater for total nitrogen (TN) (5.5 mg/l) and total phosphorus (TP) (2.0 mg/l); the City of Durham/South Durham WWTP and the Durham County/ Triangle WWTP chose to comply with these limits. A number of other municipalities elected to seek an extension of the compliance period in order to develop a calibrated nutrient response model of the lake. Modeling has indicated that two of the three sections of the lake would need even more stringent controls. The state has further refined the model to develop a TMDL and to guide development of a management plan for nutrient sensitive waters that would apply to wastewater discharges and to nonpoint sources, including stormwater discharges. During the fiscal year City staff reviewed and submitted comments on the draft TMDL for Jordan Lake. Also during the fiscal year, the state developed draft rules intended to implement the management plan. The public comment period for the draft rules extends into FY08, and City staff are reviewing and evaluating the draft rules, evaluating compliance strategies, and developed planning level cost estimates in preparation for submitting comments at public hearings to be held in FY08.
- With both Jordan Lake and Falls Lake impaired by excess levels of nitrogen, a number of staff members participated in a web-cast sponsored by Tetra Tech by Randall Dodd on "It's Not Just Phosphorus that Controls Trophic State in Fresh Waters."

Staff Training:

Staff members have conducted workshops and have participated in training by attending a number of conferences, workshops, seminars, webcasts and other training events, many of which have been mentioned above. An instructional video included information on implementing industrial stormwater inspection programs. A video on Industrial Stormwater Pollution Prevention was presented to staff at Fleet Maintenance. Webcasts included the EPA webcasts Conducting Illicit Discharge Detection and Elimination Programs (IDDE 101), Pollution Prevention for Municipal Operations, and Watershed Plan Builder, and N-Steps Limiting Nutrients in Freshwater Systems. Staff

attended a workshop on Stream Gauging. One staff member attended the EPA Water Quality Standards Academy. Seminars included “NC Nutrient Criteria and the Reservoir Protection Act” – the Act focuses almost exclusively on two reservoirs to which the City drains: Jordan Lake and Falls Lake.

Program Budget for Fiscal Year 2008:

The principle source of revenue to fund the program is a stormwater utility fee. Property owners are billed for Stormwater Charges based on the impervious area of their property (measured in Equivalent Residential Units (ERU), or 2,400 square feet). The monthly charge for each commercial ERU is \$4.50. For single-family residential properties, the charge is \$4.50 per month if the impervious area is 2,000 square feet or more. If the total impervious area is less than 2,000 square feet, the monthly charge is \$2.17. Also included in this category are fees for the removal of dead animals from veterinary hospitals, a service provided by the Street Cleaning division. The Stormwater Fee ordinance exempts City streets, but not City buildings, from Stormwater Fees.

Stormwater fees were last increased during FY05. No fee increase in the utility fee was requested for FY08. Revenues have been increasing because the stormwater billing unit has been diligent in correcting and updating its database, and because the unit implemented cutting-edge innovations, including GIS tracking of impervious surfaces and annual satellite imagery to track changes in impervious surfaces, as discussed in “Satellite Imagery: A Crucial Resource for Municipal Stormwater Billing,” Stearns C, et. al., ESRI User Conference, San Diego, CA, June, 2007. Overall effectiveness of stormwater billing has improved significantly after responsibility for this function was returned to the Stormwater Services Division. The stormwater budget is shown in **Table 8**.

The budget adopted for FY08 provides funding for 90.6 full-time equivalent positions as shown in **Table 8** in the appendix. Positions are distributed as follows: Stormwater Services, 31; Public Stormwater Facilities Maintenance, 26; Street Sweeping (including litter control), 28; and Administration, 5.6.

The budget adopted for FY08 provides for appropriations of \$11,298,772, a 24.6% increase. This increase was due to a one time appropriation from fund balance. The authorized revenues and appropriations for the operating budget are summarized in **Table 8** in the appendix. The Stormwater Capital Projects Budget is shown in **Table 9**.

Areas of concern in the City’s Stormwater Management Program include the following:

- Concern that complaint-driven illicit discharges occupy most available staff time, leaving too little time to conduct proactive dry weather screening to find illicit discharges in priority areas. Two positions have been approved in the FY08 budget for Stormwater Services to inspect the most critical facilities, and to work with Fire Department on the other facilities.
- Concern that development and management of the stormwater management program and the water quality restoration plans required under the new permit are

beyond existing staff resources unless existing activities are severely curtailed. A position has been approved in the FY08 budget for a Supervisor/Modeler position to assist with some of these activities.

The City will continue its ongoing activities in the Commercial and Residential, Illicit Discharges and Improper Disposal, and Industrial and Related Facilities Programs. The following water quality monitoring activities are planned:

Plan highlights for the coming year:

- Develop a new Stormwater Management Plan that will detail how the City will implement provisions of its NPDES Municipal Stormwater Permit, NCS000249, which became effective July 1, 2007. Continue implementing the existing Stormwater Management Plan until the new plan has been approved.
- Work with other phase I permittees to develop a common Water Quality Assessment and Monitoring Program.
- Work with consultants to develop an Ellerbe Creek Watershed Implementation Plan to update and extend the existing Ellerbe Creek Local Watershed Plan.
- Contract a watershed plan for the Third Fork Creek watershed.
- Continue to work with the lead agencies that are developing Local Watershed Plans for Lick Creek and Northeast Creek.
- Work closely with the consulting team that is developing the LWP update and implementation plan for Ellerbe Creek.
- Continue to participate in Clean Water Education Partnership (CWEP) consortium, which develops and funds mass media education efforts in the area.
- Continue to solicit participation in the City's Green Business Recognition Program.
- Continue to coordinate with the Durham Environmental Affairs Board.
- Enforcement of the revised illicit discharge ordinance and continued development and distribution of educational materials to explain the ordinance. Continued development and refinement of administrative procedures to guide enforcement, including establishment of internal financial mechanisms to handle civil penalties.
- Source identification and elimination: continue to use and promote the hotline; if time allows, conduct intensive investigations in South Ellerbe Creek and upper Goose Creek.
- Continue to coordinate with the Durham County Sediment and Erosion Control Program to foster effective control and enforcement at construction sites.
- Continued assessment of post-construction stormwater treatment BMPs at development sites to make sure they are properly constructed.
- Continued assessment of older existing BMPs to bring them up to design function.
- Continue working with the NC Ecosystem Enhancement Program on stream restoration projects including Ellerbe Creek at Northgate Park, and Goose Creek between Eastway Elementary School and Long Meadow Park.
- Conduct pre-project biological monitoring of stream segments scheduled for stream restoration projects. If possible, also monitor the reference reaches used for these projects.
- Improve tracking and reporting of existing preventative maintenance inspections of stormwater inlets that are part of the MS4.

- Conduct annual audit of City industrial facilities with NPDES Stormwater Permits, evaluating Stormwater Pollution Prevention Plans, inspection logs, and monitoring results and records.
- Identify other City facilities that need to develop Stormwater Pollution Prevention Plans.
- Continued implementation of Industrial Inspections at private sites that drain to the MS4.
- Continue to update the map and inventory of the stormwater system in the City, adding new structures built.
- Continue to identify and map other sources or potential sources of pollution. Specifically, continue to collect, compile, consolidate and analyze data on industrial permit holders, septic-sand filter systems, sanitary sewer overflows, and other sources of fecal coliforms, nutrients, and other pollutants.
- Continue with monthly ambient monitoring on a fixed schedule.
- Continue staff professional development: (1) the benthological monitoring lab supervisor and assistant supervisor will serve on a national committee that arranges and facilitates the workshop that provides certified sample identification by experts as a service to working taxonomists at the annual meeting of the North American Benthological Society, (2) participation of these and other staff in the annual CABW.
- Seek state certification for the City's benthological monitoring lab.
- Begin transitioning biological monitoring in urban streams to winter in order to minimize the impacts of seasonal drought. Once this transition has been completed, the City will work with researchers to assess the number of samples needed to assess trends and will evaluate the need to monitor annually.
- Continue to participate in the Technical Advisory Committee for the Falls Lake Nutrient Sensitive Waters Management Plan.
- As a result of assuming responsibility for stormwater utility billing, the Stormwater Services Division expects to increase revenues through more rapid inclusion of new development in our billing system, and also by more actively pursuing unpaid utility bills and identifying unbilled and under-billed accounts.

Work Space Planning

In addition to the above planned activities, the City is evaluating options to consolidate the Public Works Department into one location, and to address other workspace issues at City Hall and the ancillary Annex Building. Currently a number of work units within the Public Works Department are working out of multiple locations. Stormwater Services engineering and water quality personnel are housed in three different locations in two buildings, which impairs coordination, communication and management. Other work units within the Public Works Department have similar challenges, all of which is compounded by limited space for expansion.

The City is considering several options that would improve management, communication, and coordination, and that would alleviate current overcrowding and accommodate short-term growth. A number of different options are under consideration, and the work may occur as part of a larger project to renovate the entire City Hall complex to address public access, ADA, and workspace issues faced by other

departments. It is anticipated that consolidation may involve remodeling, reconstruction and reconfiguration of workspaces in several different locations in both of the buildings currently occupied by Stormwater Services staff. Reconstruction and remodeling will require Public Works and other City personnel – including Stormwater Services staff - to move to temporary work spaces during the remodeling process, and to move again once construction has been completed. A number of work activities are likely to be disrupted for a period of time while personnel are being moved. Depending upon the location of temporary work spaces, the sequencing of construction activities, and which personnel are moved, overall coordination and communication may be impeded, and the efficiency of certain activities may be reduced while personnel are working from remote temporary work spaces. The timing and sequencing of this work has not been determined, but it is possible that work could begin during the coming fiscal year.

Table 1
CWEP Public Service Radio Advertising
June 2007 Campaign
Triangle Market*

Media Outlet	Spots	Target Demo: Men 18-34 (Pop 187,300)				Total Adults (18+) Pop. 1,071,200			
		Net Reach	Reach%	Frequency	Impressions	Net Reach	Reach%	Frequency	Impressions
WBBB	57	34,400	18.1 %	3.2	108,900	81,300	7.6 %	3.1	248,700
WFXC/K ¹	78	7,700	4.1 %	4.1	31,800	66,800	6.2 %	3.9	261,900
WQDR	57	17,100	9.1 %	3.1	52,800	133,300	12.4 %	3.3	443,700
WYMY	57	21,100	11.2 %	3.8	80,700	42,900	4.0 %	4.6	196,500
Total	249	69,100	36.9 %	4.0	274,200	291,100	27.2 %	4.0	1,150,800

* Triangle Market: Chatham County, Durham County, Orange County, Wake County (including towns and cities in these counties)

¹ WFXC and WFXK are simulcast stations; their performance is provided as a combined figure in all places where both frequencies are available. The same is true of WRNS, which broadcasts on both an AM and an FM frequency.

Table 2
CWEP Public Service TV Advertising
Spring 2007 Campaign
Triangle Market*

Media Outlet	Spots	Impressions	Cost
WTVD-TV (ABC-11)	88	4,981,000	\$ 24,628.75
WRAL-TV (CBS-5)	95	16,485,000	38,965.00
Time Warner Cable TV	903	1,519,500	13,282.70
Total	1,118	22,985,500	\$ 76,976.45

* Triangle Market: Apex, Carrboro, Cary, Chapel Hill, Chatham County, Durham, Durham County, Fuquay-Varina, Garner, Goldsboro, Hillsborough, Holly Springs, Johnston County, Knightdale, Morrisville, Nash County, Orange County, Oxford, Raleigh, Rocky Mount, Smithfield, Spring Lake, Tarboro, Wake County, Wake Forest, Wayne County, Wilson

Table 3
Summary of Field Investigation Results:
Sources or Potential Sources of Water Pollution
July 1, 2006 – June 30, 2007

SubBasin Name	E & S	Septic System	Sand Filter System	Private Sewer Lateral	Wash Disch	SSO	Sewer leak, break	Petroleum	Yard Wastes	Paint	Grease, Cooking Oil, Food	Illicit Connections	Other	Total Number of Sources
Ellerbe Creek	2			4		7	10	14		2	1	2	17	59
Eno River	1					5		1	1				1	9
Little Lick Creek	1	2	1	1		4		4		1			1	15
Lick Creek														
Brier Creek														
Little River													1	1
Panther Creek														
Crooked Creek						1					1		1	3
New Hope				3		5	2	2		1		1	3	17
Northeast				1		3							1	5
Stirrup Iron						1					1			2
Third Fork	1	1		3		7		2	2		1		2	19
TOTALS	5	3	1	12	0	33	12	23	3	4	4	3	27	130

E & S = erosion and sedimentation

Wash. Disch = Laundry wash water discharge

SSO = Sanitary Sewer Overflow

Table 4
City Facilities Requiring
NPDES Industrial Stormwater Permits

Facility	Type	Permit Number or Certificate of Coverage	Application Date	Effect or Coverage Date	Facility Contact
South Durham Water Reclamation Facility	Industrial Stormwater-NCG11	NCG110082	3/9/2004	5/21/2004	Bob Dodson
North Durham Water Reclamation Facility	Industrial Stormwater-NCG11	NCG110092	12/1/2005	2/10/2006	John Dodson
Fleet Maintenance	Industrial Stormwater-NCG8	NCG080771	3/6/2006	6/16/2006	Kent Cash
Solid Waste Vehicle Wash Facility	Industrial Stormwater-NCG8	NCG080773	3/18/2006	4/26/2006	Philip White
Public Works Operations (PWOC) Center/Water Management/Fuel Island	Industrial Stormwater-NCG8	NCG080776	7/17/2006	8/11/2006	Don Greeley
DATA Bus Maintenance Facility, 1903 Fay Street	Industrial Stormwater-NCG8	NCG080788 (issued to contact operator, MV Transportation)	11/2006		James Tinsley, MV Transportation; Jim Frei, consultant

Table 5
Industrial Facilities Summary

Facility Type	Potential Number*	Number Sent Survey*	Number Responding
Adhesives & Sealants	1	1	1
Aircraft Manufacture	1	1	1
Aluminum Forming	1	1	1
Apparel, Printing, Leather, Rubber	17	0	0
Automotive	31	31	4
Bottling & Canning	2	2	1
Chemical Manufacture, Repackaging, Distribution	3	3	1
Electrical & Electronic Equipment	2	2	1
Firefighting & Emergency	2	0	0
Food & Kindred	5	0	0
Furniture Manufacture	4	4	0
Glass	3	3	0
Marinas & Shipbuilding	1	1	1
Metal Fabrication	20	6	2
Minerals	1	1	0
Other	3	3	3
Paints & Varnish	4	4	1
Paving & Roofing Materials	4	4	1
Pesticide Applicators	2	2	0
Petroleum Bulk Stations & Terminals	1	0	0
Pharmaceutical Manufacture	12	12	1
Printing	3	3	1
Ready Mix Concrete	2	0	0
Recycling	3	3	1
Sales	1	1	1
Semiconductors	3	3	1
Service Machinery	1	1	1
Steam Electric Power	1	1	0
Switchgear	1	1	1
Textile Mills	1	1	0
Transit & Transportation	5	5	0
Treatment Works	2	2	0
Trucking & Warehouse	4	4	2
SUM	147	106	27

*Many industrial facilities are located outside the City of Durham. For example Research Triangle Park (RTP) borders the City of Durham but is not subject to annexation. The City does not exert authority over an ETJ. One purpose of the survey is to identify which industrial facilities are located within the City, and which of those may discharge to the MS4.

Table 6
Preliminary Biological Monitoring Results
For Summer Collection 2006

SubBasin/ Stream Name	Site	Drain. Area (acres)	River Basin	Total Taxa	Total EPT	Biotic Index (NCBI)	Biotic Rating (NCBI)	Water Quality Improve or decline (based on NCBI)
Little River (ref)	LR9.6LR	77.8	Cape Fear	86	24	5.58	Good	Declined
Flat River (ref)	FR13.0FR		Neuse	69	24	5.73	Good	Declined
New Hope (ref)	NH8.8NHC	22.0	Cape Fear	57	16	5.79	Good- Fair	Same
Eno River	EN8.9ER	140.8	Neuse	50	18	5.77	Good- Fair	Declined
Eno River	EN4.9ER	148.3	Neuse	63	18	6.5	Fair	Declined
New Hope/ Mud Creek	NH2.3MC	5.3	Cape Fear	Not sampled – no water				
Lick Creek	LC1.1LC	10.0	Neuse	37	11	6.67	Fair	Improved
Panther Creek	PN2.4PN	2.5	Neuse	Not sampled – no water				
New Hope/ Sandy Creek	NH1.0SC	6.8	Cape Fear	29	3	7.29	Fair	improved
Ellerbe Creek	EL1.9EC**	21.9	Neuse	29	6	7.35	Fair	Same
Northeast Crk	NE0.0NE	13.1	Cape Fear	34	3	7.92	Poor	Declined
Third Fork Creek	TF0.0TC	16.5	Cape Fear	39	4	7.69	Poor	Declined
Ellerbe Creek	EL8.2EC	4.7	Neuse	24	4	7.21	Fair	Improved
Third Fork Crk	TF1.2TC		Cape Fear	23	2	7.48	Fair	Same
Ellerbe Creek/ Goose Creek	EL5.5GC	5.0	Neuse	31	3	7.85	Poor	Improved
Ellerbe Creek	EL5.6EC	10.7	Neuse	42	2	7.68	Poor	Improved
Little Lick Crk	LL3.4LLC	5.8	Neuse	38	2	8.35	Poor	Declined
Ellerbe Creek	EL7.9EC	5.2	Neuse	40	4	7.46	Fair	Same
Little Lick Crk	LL4.6LLT2	1.8	Neuse	Not sampled – no water				

Table 7
Ambient Stream Monitoring Summary
Calendar Year 2006

				Over- all	Fecal Coliform (FC)		Dissolved Oxygen (DO)		Organic Enrich	Nutrients		Dissolved Metals - EPA Continuous Chronic Criteria (CCC)		Turbidity		Average Conductivity (us/cm)			
	Major Stream	Site ID	Land Use	Avg. WQI - Water Quality Index	Geometric Mean Pathogen Indicator, FC (cfu/100ml)	Percent of FC samples > 400	Percent of (DO) Samples Less than 4.0 mg/l	Average DO mg/l	Average BOD (mg/l)	Average Total Nitrogen (mg/l)	Average Total Phosphorous (mg/l)	Percent of dCu samples > EPA CCC for Cu	Percent of dZn samples > EPA CCC for Zn	Average Turbidity (nTu)	Percent of Samples Exceeding 50 nTu				
Neuse River Basin	Falls Lake Watershed	Flat River	FR5.2FR	[Dam]	84	18	0%	8%	6.9	2.08	0.68	0.06	0%	0%	7.0	0.0	84		
		Flat River	FR13.0FR	R	87	117	17%	0%	8.4	2.33	0.69	0.06	0%	0%	22.1	8%	83		
		Little River	LR9.6LR	R	88	93	17%	0%	9.4	2.33	0.68	0.06	0%	0%	16.2	8%	91		
		Eno River	EN4.9ER	R[+u]	86	145	17%	0%	8.4	2.17	0.89	0.06	0%	0%	16.0	8%	121		
		Eno River	EN8.9ER	R[+u]	86	105	17%	0%	9.5	2.08	0.88	0.06	0%	0%	12.7	8%	118		
		Eno River	EN13.3ER	R	86	77	17%	0%	8.7	2.17	1.03	0.06	0%	0%	11.1	8%	122		
		Ellerbe Creek	EL1.9EC	U+WW	76	304	42%	0%	7.6	2.00	3.29	0.08	0%	0%	11.3	0%	381		
		Ellerbe Creek	EL5.6EC	U	85	255	33%	0%	7.7	2.25	0.69	0.07	8%	0%	14.9	0%	213		
		Ellerbe Creek	EL7.9EC	U	87	152	42%	0%	7.9	2.17	0.75	0.06	25%	0%	14.9	0%	200		
		Ellerbe Creek	EL8.2EC	U		140	27%	0%	8.8						15.1	0%	201		
		Ellerbe Creek	EL10.7EC	C		330	50%	17%	7.8						37.8	17%	174		
		Ellerbe Creek	EL5.5GC	D+I		1691	67%	0%	6.7						37.3	25%	246		
		Ellerbe Creek	EL8.1GC	D	69	2393	83%	0%	7.3	3.18	1.22	0.05	8%	0%	34.0	8%	358		
		Ellerbe Creek	EL7.1SEC	D	75	501	58%	8%	6.7	2.83	0.97	0.06	17%	0%	12.1	0%	300		
		Ellerbe Creek	EL8.5SEC	D		4309	100%	17%	6.1						33.7	25%	283		
		Ellerbe Creek	EL7.6SECT	D		1309	92%	8%	7.2						8.3	0%	325		
		Cape Fear R Basin	Jordan Lake Watershed	Panther Creek	PN2.4PN	R	78	230	42%	17%	7.2	2.08	0.62	0.06	0%	0%	52.2	42%	144
				Little Lick Crk	LL3.4LLC	S	72	558	50%	17%	6.5	2.58	0.72	0.06	8%	0%	67.2	33%	182
				Little Lick Crk	LL4.6LLT2	S	78	726	50%	8%	7.5	2.45	1.36	0.07	0%	0%	41.7	8%	258
				Lick Creek	LC1.1LC	R	78	375	50%	0%	8.2	2.00	0.60	0.07	0%	0%	69.3	50%	133
	Lick Creek			LC2.0RBC	R	65	960	75%	33%	6.1	3.36	1.03	0.07	0%	0%	43.8	33%	163	
	Stirrup Iron Crk			SI1.6SIC	U	71	265	33%	17%	5.9	3.67	0.65	0.08	75%	0%	33.0	17%	175	
New Hope Crk	NH0.0NHC			U	81	306	33%	8%	7.9	2.17	0.67	0.07	0%	0%	40.5	25%	154		
New Hope Crk	NH3.0NHC			R	88	37	18%	0%	9.1						9.8	0%	116		
New Hope Crk	NH8.8NHC			103		17%	0%	9.1	2.00						0.68	0.06	0%	0%	12.7
New Hope Crk	NH2.3MC			S	83	174	25%	0%	8.9	2.33	0.92	0.07	0%	0%	57.5	33%	143		
New Hope Crk	NH1.0SC			S	80	313	33%	0%	8.6	2.58	0.88	0.08	17%	0%	58.4	33%	218		
New Hope Crk	NH4.8SCTDT			U		606	55%	0%	8.1						15.0	0%	244		
New Hope Crk	NH5.0SCTD			U		717	45%	0%	8.7						10.7	0%	220		
Third Fork Crk	TF0.0TC			S		203	27%	17%	7.4						35.6	25%	193		
Third Fork Crk	TF4.4TC	D	847	55%		0%	8.2	17.9	8%						256				
Third Fork Crk	TF5.6TC	D	76	812	58%	25%	6.7	2.18	0.87	0.09	8%	0%	12.9	0%	247				
Third Fork Crk	TF5.1RC	D	76	639	50%	8%	6.9	2.33	0.77	0.11	0%	0%	31.5	25%	296				
Third Fork Crk	TF6.5RCUT	D+I	67	1807	83%	8%	6.6	3.75	1.27	0.14	0%	0%	9.6	0%	518				
Northeast Crk	NE0.0NE	U	78	179	25%	33%	5.5	2.08	0.60	0.07	25%	0%	35.8	17%	175				
Northeast Crk	NE1.2NE	U+I		327	36%	42%	5.8						41.3	33%	175				

Land Use: R-rural; U-general urban mixed use; S-suburban; D-older developed area near downtown; I-industrial; WW-wastewater.
Lower case letter indicates probable minor impact.

Table 8
Stormwater Management Fund

	Actual FY 2005-06	Adopted FY 2006-07	Estimated FY 2006-07	Adopted FY 2007-08	Change
Authorized Positions					
Public Works	46.6	54.6		62.6	
Solid Waste	26.3	28.0		28.0	
Total Stormwater Fund	72.9	82.6		90.6	9.7%
Revenues					
Operating Revenues (Stormwater charges)	\$ 7,697,477	\$ 8,068,718	\$8,855,063	\$ 8,750,190	8.4%
Investment Interest Income	60,507	114,241	100,238	218,332	91.1%
Miscellaneous Revenue (Permit Fees)	88,536	232,000	64,889	150,250	-35.2%
Transfers from Other Funds	-	197,000	197,000	210,000	6.6%
Appropriations to Fund Balance	-	545,438	119,127	1,970,000	333.5%
Total Revenues	\$ 7,846,520	\$ 9,066,397	\$9,336,317	\$11,298,772	24.6%
Appropriations					
Personal Services	\$ 3,078,103	3,909,623	3,392,359	4,527,611	15.8%
Operating	1,830,798	1,890,377	2,080,908	1,645,377	-13.0%
Capital	713,634	21,870	47,330	20,000	-8.6%
Transfers to Other Funds	1,997,690	2,465,654	3,504,154	4,638,190	88.1%
Transfers to Fund Balance	226,295	778,873	311,566	467,594	-40.0%
Total Appropriations	\$ 7,846,520	\$ 9,066,397	9,336,317	\$11,298,772	24.6%
Departmental Appropriations					
Public Works	4,922,305	4,762,871	5,791,439	5,067,964	6.4%
Solids Waste	1,581,169	1,645,538	1,557,236	1,655,113	0.6%
Nondepartmental Appropriations	1,343,046	2,657,988	1,987,642	4,575,695	72.1%
Total Appropriations	\$ 7,846,520	\$ 9,066,397	\$ 9,336,317	\$11,298,772	24.6%

Non-departmental charges include a payment to the General Fund for indirect costs, a payment to the Water and Sewer Fund for the Stormwater Fund share of utility billing and payment to the Risk Fund for insurance (liability, workers' compensations, general insurance, safety and health programs).

Table 9
Stormwater Capital Projects Funding FY 08

Number	Project Title	Revenue Source	Appropriation	Revenue
1	Drainage Repair of City Owned Properties	Stormwater Fund	270,000	270,000
2	Floodplain Mitigation	Stormwater Fund	400,000	400,000
3	Hock Plaza Public System Improvements	Stormwater Fund	1,500,000	1,500,000
4	Major Stormwater Infrastructure & BMP Improve	Stormwater Fund	1,000,000	1,000,000
5	Private Property Drainage	Stormwater Fund	4,138,370	4,138,370
6	Stream Gauging Stations	Stormwater Fund	300,000	300,000
7	Watershed Planning & Design	Stormwater Fund	1,437,000	1,437,000
TOTAL			\$ 9,045,370	\$ 9,045,370

Figure 1

Stream Restoration & Stormwater Treatment Retrofit Projects

